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Participation in cycling, at what cost? Determinants of cycling expenses

Erik Thibaut

Policy in Sports and Physical Activity Research Group,
KU Leuven, Belgium
Email: erik.thibaut@faber.kuleuven.be

Steven Vos

Policy in Sports and Physical Activity Research Group,
KU Leuven, Belgium
and
Department of Industrial Design,
Eindhoven University of Technology, Netherlands
and
School of Sport Studies,
Fontys University of Applied Sciences, Netherlands
Email: steven.vos@fontys.nl

Wim Lagae

Department of Marketing,
KU Leuven, Belgium
Email: wim.lagae@kuleuven.be

Tom Van Puyenbroeck

Research Centre for Economics and Corporate Sustainability,
KU Leuven, Belgium
Email: tom.vanpuyenbroeck@kuleuven.be

Jeroen Scheerder*

Policy in Sports and Physical Activity Research Group,
KU Leuven, Belgium
Email: jeroen.scheerder@faber.kuleuven.be
*Corresponding author

Abstract: This study analyses the determinants of cycling expenditure by means of a Tobit regression analysis, based on a dataset of 5,157 cyclists. Using a heterodox economic approach, 23 different variables are combined into two commonly used variable groups in the field of sports expenditure (socio-demographics, sports intensity variables) and two variable groups [socio-economic cycling capital, and attitudes, interests, opinions (AIOs)] that

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are less frequently incorporated. With all variables included in the Tobit regression, sex, trip duration, frequency, number of cycling variants practised, visiting cycling websites, and practicing road bicycle racing or mountain bike influence cycling expenditure positively. A negative association is found with competitive riding and cycling drop out. It is suggested that marketers of cycling services and cycling apparel should meet the cyclist's need for identification instead of focusing solely on socio-demographic factors.

Keywords: cycling; expenses; expenditure; cost; heterodox; Tobit regression; determinants; sports participation; segmentation; sports management; sports marketing.

Reference to this paper should be made as follows: Thibaut, E., Vos, S., Lagae, W., Van Puyenbroeck, T. and Scheerder, J. (2016) 'Participation in cycling, at what cost? Determinants of cycling expenses', *Int. J. Sport Management and Marketing*, Vol. 16, Nos. 3/4/5/6, pp.221–238.

Biographical notes: Erik Thibaut is a PhD student at the Policy in Sport and Physical Activity Research Group at the KU Leuven (Belgium). His research focuses on the expenditure that people make while taking part in sport, and he has been involved as an author in five internationally peer reviewed journals. He holds a Master in Sport Management, and a Master in Economics. At the Faculty of Kinesiology (KU Leuven), he is an assistant in the field of sports management and statistics.

Steven Vos is an Associate Professor and holder of the Chair Move to Be at the School of Sports Studies, Fontys University of Applied Sciences (The Netherlands). He is also a Research Fellow at the Policy in Sports and Physical Activity Research Group, KU Leuven (Belgium). His main areas of research are policy and management in sport and physical activity, and supply and demand of grassroots sport.

Wim Lagae (PhD in Economics) is an Associate Professor in Sports Marketing at the KU Leuven (Faculty of Economics and Business, Campus Antwerp) and lectures sports marketing and communications at the Faculty of Kinesiology and Revalidation Sciences at the KU Leuven. He is a part-time Associate Professor at the Faculty of Medicine and Health Sciences at Ghent University. His research deals with sports sponsorship selection and leverage, in the field of spectator sports. He has published on the peculiarities of professional road cycling in the *Journal of Business and Industrial Marketing* and in *European Sports Marketing Quarterly*.

Tom Van Puyenbroeck is a Professor of Economics at the Faculty of Economics and Business of KU Leuven, and a Visiting Professor at Universités Saint-Louis in Brussels. He has published i.e., on efficiency measurement, composite indicator methodology, fair division, the economics of education, and sports, in journals such as *Omega*, *The International Journal of Management Science*, *European Economic Review*, *Journal of Economic Inequality*, *Journal of the Operational Research Society*, *Journal of Sport Economics*, *International Journal of Sports Finance*, *Labour Economics*, *Expert Systems with Applications*.

Jeroen Scheerder is an Associate Professor in the Department of Kinesiology and the Head of the Policy in Sport and Physical Activity Research Group at the KU Leuven, Belgium. He lectures in the fields of public sport policy and sport governance. His research focus is on policy-related and socio-economic aspects of sport and leisure-time physical activity. He is a Guest Professor at

the universities of Brussels, Cassino, Cologne, Jyväskylä, Kaunas and Porto, and was a Visiting Professor of Sport Sociology at the Faculty of Political and Social Sciences, Ghent University. He (co-)authored more than 45 articles in peer reviewed journals.

This paper is a revised and expanded version of a paper entitled 'Participation in cycling, at what cost? Determinants of cycling expenses' presented at the European Conference on Sports Economics, Antwerp, 3–5 September 2014.

1 Introduction

Today, cycling for leisure, recreation and tourism is a very popular activity. Bicycle sales across Europe, the USA and New Zealand reached record levels (Gluskin Townley Group, 2014; Lamont, 2009). Worldwide, an average of more than 100 million bikes a year were produced during the last decade (Gardner, 2009), 20 million of which were sold in Europe (Colibi and Coliped, 2012). In the Netherlands the average sale price per bicycle is €746, which is by far the highest of the EU member states, followed by Germany (€495), Denmark (€420), Austria (€420), and Belgium (€410) (Colibi and Coliped, 2012). Together with bicycles, a high variety of related cycling products and services are commercialised. Although it is commonly known that people spend relatively large amounts of money on cycling, little research has focused on the determining factors of cycling expenditure.

The sharp rise in sports participation rates during the last decades in Europe (Scheerder et al., 2011b), the USA (Schoenborn and Barnes, 2002) and Australia (Standing Committee on Recreation and Sport, 2010) is one of the evident causes of the increasing importance of sports consumption in total economic outlays, as indicated by Davies (2002) and Lera-López and Rapún-Gárate (2007). Yet after the spectacular increase in sports participation since 1970, its growth seems to have flattened out, with even a slight downturn in some European countries (Lera-López and Rapún-Gárate, 2011; Scheerder et al., 2011b). Therefore, it is interesting to look for new growth opportunities, of which cycling is a prime example. In ten of the 12 European countries that were investigated in the study of Scheerder et al. (2011a), cycling is listed in the top five of most popular sports. In Flanders, the Dutch speaking part of Belgium that constitutes the research context of this study, cycling is the second most popular sport (Scheerder et al., 2011b). Moreover, cycling is a prime example of a sports activity that is not necessarily practised in formal settings (such as voluntary sports clubs) and that takes place independently of specific times and places (Breuer et al., 2011). While the popularity of traditional sports has stagnated, participants now favour these new kinds of sports activities, such as sports participation in informal groups, commercial arrangements, mass sports events, or just individual sports participation (Lera-López and Rapún-Gárate, 2005; Scheerder et al., 2011a). In fact, nowadays the majority of the grass roots sports participation in Europe takes place outside the boundaries of sports clubs (European Commission, 2010).

There are three reasons why this study focuses on the determinants of cycling expenditure. First, most studies focus on expenditure on sports participation in general (e.g., Lera-López and Rapún-Gárate, 2005; Thibaut et al., 2014), while both practice and research (e.g., Hallmann and Wicker, 2015; Wicker et al., 2010) demonstrate that significant differences exist between different kinds of sports. Second, the present study not only investigates the influence of socio-demographic and socio-economic variables on sports expenditure, fitting within the framework of orthodox (neoclassical) economics. Indeed, we build on a so-called heterodox theoretical perspective – as explained below – to look at additional explanatory variables. Third, the large number of cycling participants provides a favourable market for both the private sector and public authorities. With respect to the former, research demonstrates that taking part in cycling goes hand in hand with relatively large cycling expenses compared to other sports, because capital goods like a bike and other sports equipment and apparel are needed (Humphreys and Ruseski, 2009). For public authorities, the promotion of cycling is interesting because it offers financial savings to both the individual and the community, as cycling generates more economic benefits (e.g., health, tourism, cycling apparel industry) than costs (Oja et al., 2011).

2 Literature review and hypotheses

2.1 Theoretical background

Different theoretical perspectives have been used to explain the determinants of sports participation and sports expenditure (for an overview see Downward and Rasciute, 2010). The economic theories can be divided into two broad categories. On the one hand, the *neoclassical, orthodox approach* draws upon theoretical foundations such as rationality, maximising behaviour given certain constraints (e.g., time and/or money), market equilibrium and stable preferences (Downward and Riordan, 2007). According to Becker's (1965, 1976) household production theory, economic agents are both consumers and producers, such that the distinction between leisure and work disappears. Indeed, consumers combine market goods and time to produce commodities that improve their utility. The cost of time is explicitly incorporated into the consumption decision: the more someone earns per unit of time, the higher the cost of leisure (Becker, 1965; Downward, 2007). The orthodox approach has been applied in explaining sports participation (e.g., Downward, 2007; Downward and Riordan, 2007; Wicker et al., 2009) and sports expenditure (e.g., Lera-López and Rapún-Gárate, 2011; Thibaut et al., 2014).

On the other hand, the *heterodox approach to explaining choice behaviour* draws upon a wider social-scientific literature than neoclassical microeconomic theory (Downward and Riordan, 2007). The orthodox assumption of given individual preferences and individual tastes is challenged by Scitovsky (1976). According to this author, people enjoy creative activities – such as sports participation – because of the complex skills that are needed to practice them, and therefore sports participation can be a constant source of pleasant feelings such as 'surprise' and 'novelty'. The heterodox post-Keynesian approach refutes the orthodox assumption that economic agents act completely rational and individual (Downward, 2007). Agents face 'procedural' or 'bounded' rationality, as in most cases they do not have access to all information when making decisions or because they lack computational capabilities when analysing

decisions for which too much information is available (Lavoie, 2004). Consequently, social habits are supposed to be important determinants in explaining human behaviour (Downward and Riordan, 2007). The heterodox approach also focuses on sociological influences as they explain human behaviour through concrete social situations and the construction of identities (Lera-López and Rapún-Gárate, 2011), where social pressure and habitus are more important than individual feelings. Ohl and Taks (2007) found that people buy sports goods to belong to a certain group, and to distinguish themselves from other people. This theory assumes that individuals are explicitly and implicitly shaped through education by parents and by school (Bourdieu, 1984; Veblen, 1925), and through income.

The current study opts for a heterodox approach based upon a number of arguments. First, Scheerder and colleagues (2011b) suggest that social and psychological variables contribute significantly to explaining sports expenditure. Therefore, the use of a heterodox approach is the most suitable with respect to the data of this study. Second, Ohl and Taks (2007) pose that neoclassical models are less relevant for understanding the meaning and the diversity of consumption compared to heterodox models, while Downward (2007) and Downward and Riordan (2007) find more support for the heterodox category. Third, the literature overview of Downward and Rasciute (2010) demonstrates that heterodox theories have been popular in explaining and predicting sports participation.

2.2 Expenditure on sports participation: heterodox variables

While specific studies on cycling (expenditure) seem to be scarce, a high variety of general sports expenditure literature is at hand. Some of these studies focus on individual expenses in sports clubs (e.g., Wicker et al., 2010), while other take all sports contexts (club and non-club) into account (e.g., Lera-López and Rapún-Gárate, 2005), or focus on household sports expenditure (e.g., Thibaut et al., 2014).

A first set of variables that is commonly used in explaining sports expenses are socio-demographic variables. Socio-demographic determinants that are found to be positively associated with sports participation expenditure are the level of education (Dardis et al., 1994; Lera-López and Rapún-Gárate, 2005, 2007; Scheerder et al., 2011c; Wicker et al., 2010), income (Bloom et al., 2005; Casper, 2007; Lee, 2001; Lera-López and Rapún-Gárate, 2005, 2007; Wicker et al., 2010), and certain professions (Lera-López and Rapún-Gárate, 2007). It is also consistently found that men spend more money on sports participation than women (Lera-López and Rapún-Gárate, 2005, 2007; Scheerder et al., 2011c), except for sports club members (Wicker et al., 2010). A negative relationship is found for age (Dardis et al., 1994; Lera-López and Rapún-Gárate, 2007). At the household level, sports expenditure is positively related to the educational level of the household head (Thibaut et al., 2014), household income (Bloom et al., 2005; Dardis et al., 1994; Thibaut et al., 2014), having children (Bloom et al., 2005), age of the youngest child (Thibaut et al., 2014) and household size (Bloom et al., 2005; Dardis et al., 1994; Lee, 2001; Scheerder et al., 2011c), while expenditure per capita is negatively related to household size (Thibaut et al., 2014). The above results indicate that variables like sex, age, number of children, etc. are found to be significant cultural and social constraints in sports consumption (Lera-López and Rapún-Gárate, 2011; Ohl and Taks, 2007).

- *Hypothesis 1:* cycling expenses are positively influenced by the socio-demographic variables education, profession, sex, having a partner, and negatively by age and having children.

Ohl and Taks (2007) argue that the consumption of sports goods not only depends on socio-demographic variables, but that the taste of sports customers is more influenced by sports-related lifestyle variables and psychographic variables. The current study adds three groups of variables to the model, which we label as sports-specific intensity variables, socio-economic cycling capital variables, and attitudes, interests, opinions (AIOs). The latter is in line with the study of Hallmann and Wicker (2015) who investigated the influence of motivation (measured on a five-point Likert scale) on golf expenditure.

The sports-specific intensity variables describe the level at which cycling is practised. Variables like the ability level (Casper, 2007), intensity and/or frequency of participation (Davies, 2002; Lee, 2001; Lera-López and Rapún-Gárate, 2007; Scheerder et al., 2011c; Wicker et al., 2010), being involved with sports (Bloom et al., 2005), level of involvement (McGehee et al., 2003) and sports club membership (Thibaut et al., 2014) have been found to influence sports expenditure significantly. Scheerder and colleagues (2011b) found a strong relationship between sports expenditure and the sports-specific variables, while the correlations with socio-demographic variables were weak. Accordingly the following hypotheses are posed:

- *Hypothesis 2a:* cycling expenses are positively related to the sports-specific intensity variables.
- *Hypothesis 2b:* sports-specific intensity variables have a more profound impact on sports expenditure than socio-demographic variables.

A third variable category is built around the so-called ‘socio-economic cycling capital’, a term by which we seek to refer to the theory of Bourdieu (1984). These variables represent the knowledge about cycling goods and services. Downward et al. (2014) state that preferences can change by means of experience and by socialisation through significant others (such as parents, friends, etc.). The current study hypothesises that cycling capital gives cyclists insight in the scope of available cycling products and services, such that they are more convinced of the specific properties of certain products and thereby spend more money on it. With respect to the latter, it is also possible that a negative relationship is found because better informed agents know how to buy each product at the best price possible. The current study expects cyclists to gain cycling-specific knowledge from passive leisure activities (such as attending cycling courses, reading books, watching TV) on the one hand, and from active participation in cycling (cycling experience, training program) on the other hand. This results in the following hypotheses.

- *Hypothesis 3a:* cyclists who possess more active cycling capital (experience, using a training program) have higher cycling expenditure.
- *Hypothesis 3b:* cyclists who possess more passive cycling capital (reading cycling literature, visiting cycling websites, watching cycling on TV) have higher cycling expenditure.

The last category consists of AIO statements, i.e., constructs that represent people's feelings and thoughts about cycling participation and cycling consumption. Although research indicates that emotions contribute to explaining sports participation (Kang et al., 2011), the influence of AIOs on sports expenditure is not often investigated. One of the exceptions is the research of Scheerder and colleagues (2011b), who found that a positive attitude towards sporting goods increases sports apparel expenses. Lera-López and Rapún-Gárate (2005) found that the motivations to participate in sports are important determinants of sports participation frequency. Therefore, it is proposed that:

- *Hypothesis 4:* positive feelings and thoughts towards cycling increase cycling expenditure, while negative feelings and thoughts decrease cycling expenditure.

3 Methodology

3.1 Data

The collected data originate from a large-scale internet questionnaire, which was carried out in Flanders in 2009. The respondents were contacted by means of email databases of cycling organisations, cycling forums, advertisements in cycling magazines and newsletters, etc. The main advantage of this data collection method is the large response (5,884 respondents, of which 5,157 cyclists), while a disadvantage is that this method often generates a non-representative dataset. Primary data were collected about their cycling habits, socio-demographic characteristics, cycling expenditure, and their opinion on statements about cycling (Scheerder et al., 2011a). Essential in this study is that cycling for utilitarian purposes (e.g., commuting by bike) is left out as the focus is solely on cycling as a leisure activity. Cycling variants that are incorporated in this study are recreational cycling, performance-based cycling, competition cycling, and specific variants of cycling (road bicycle racing, recreational cycling, spinning, indoor cycling, mountain biking, etc.).

3.2 Dependent variable

Cycling expenditure on both non-durable and durable goods was surveyed. In the questionnaire respondents were asked to fill in the amount of money that they had spent during the last year on nine different product and service categories that are normally purchased rather frequently, meaning at least once a year (Table 1, first part). Next, people were asked about seven categories of non-frequently purchased goods (Table 1, second part). The respondents had to fill in the actual purchase price divided by the expected lifespan of the product in years. By using this method one source of non-genuine zero expenditure can be excluded, namely infrequency of purchase.

Table 1 Definition of the dependent variable total expenditure on cycling, which consists of both the frequent purchases and the durable goods

Frequent purchases	Bike rental and/or bike material
	Bicycle repair
	Clothes/sportswear (sports glasses included)
	Sports drink and food
	Information about cycling (magazines, books, etc.)
	Membership fee of a cycling club
	Membership of a fitness centrum
	Cycling events and bike races
	Other frequent expenses
Durable goods	Bike purchase
	Home trainer purchase
	Helmet
	Cycling shoes
	Cycling material
	Heart rate monitor
	Other durable goods

3.3 Independent variables

Recalling our hypotheses, the explanatory variables are subdivided into four major categories, viz.,

1 socio-demographic variables

2 cycling intensity variables

3 socio-economic cycling capital

4 AIOs.

An overview of the first three categories is given in Table 2.

Table 2 Independent variables, namely socio-demographic variables, socio-economic cycling capital variables, and cycling intensity variables

	Variable	*Description and/or categories*
Socio-demographic	Sex	Male (69.28%), female (30.72%) (range 0–1)
	Age	Age of the respondents (mean 41.634; SD 14.252)
	Children	Having children: no (59.89%), yes (40.11%) (range 0–1)
	Partner	Having a life-partner: no (30.71%) yes (69.29%) (range 0–1)
	Education	Highest level of education: still at school (11.53%), first stage of secondary school or less (9.05%), secondary school (26.18%), higher education (53.24%) (range 1–4)
	Profession	Blue-collar (11.17%), white-collar (74.54%), not in labour force (14.30%) (range 1–3)

Table 2 Independent variables, namely socio-demographic variables, socio-economic cycling capital variables, and cycling intensity variables (continued)

	Variable	*Description and/or categories*
Intensity	Duration	Duration of an average ride: < 60 minutes (17.01%), 60–119 minutes (26.57%), 120–180 minutes (33.20%), > 180 minutes (23.22%) (range 1–4)
	Frequency	Number of times a week: ≤ once a week (33.12%), one till three times a week (40.51%), ≥ 3 times a week (23.36%) (range 1–3)
	Level	Recreational (60.70%), performance-based (32.64%), competition (6.66%) (range 1–3)
	Context	Individual (21.44%), light sports community (42.83%), sports club (35.73%) (range 1–3)
	Number of cycling variants	Number of cycling variants (mountain biking, spinning, bmx, recreational cycling, road bicycle racing, etc.) that one practices: 1 (32.37%), 2 (29.93%), 3 (19.94%), ≥ 4 (17.76%) (range 1–3)
Cycling capital	Cycling on TV	Cyclist watches to cycling on TV: no (20.54%), yes (79.46%) (range 0–1)
	Training program	Cyclist uses a written training program/scheme: no (88.72%), yes (11.28%) (range 0–1)
	Literature	Cyclist reads cycling literature: no (64.49%), yes (35.51%) (range 0–1)
	Website	Cyclist consults cycling websites: no (50.86%), yes (49.14%) (range 0–1)
	Cycling years	Year that cyclist has begun with cycling: ≤ 1990 (28.34%), 1990–1999 (25.43%), 2000–2004 (23.53%), 2005–2009 (22.70%) (range 1–4)
	Other sport	Cyclist practices also other sports than cycling: no (29.37%), yes (70.63%) (range 0–1)
Control	Cycling variant	Principal cycling variant that one practices: recreational cycling (48.88%), road bicycle racing (39.86%), mountain biking (9.18%), indoor cycling (1.75%)

The *socio-demographic variables* are rather classic since they are often used in socio-economic analyses: sex, age, having children, having a partner, education, and profession. The operationalisation of these variables is straightforward (see Table 2).

The second category, *sports intensity*, defines how much cycling someone consumes. Variables belonging to this category are the average duration of a cycling tour, the number of cycling trips a week, the level at which the sport is practised, the setting in which cycling is practiced, and the number of cycling variants that someone practises (regular biking, racing, mountain biking, indoor cycling, etc.).

Third, the *socio-economic cycling capital* category is operationalised through variables that are taken to represent the sports-specific cycling knowledge of participants, more particularly watching cycling on television, following a personal training scheme, consulting cycling-related web pages, reading cycling literature, practicing other sports, and the number of years a respondent has been cycling. In Flanders, watching cycling on TV is potentially an important determinant, as cycling is one of the most popular spectator sports on TV. For example, Flanders has by far the highest Tour de France TV ratings (number of viewers related to the number of inhabitants) in the world, and 70% of the adult population has at least once been a spectator of the classic 'Tour of Flanders' (van Reeth, 2013). With regard to cycling experience, one could expect experienced cyclists to have gained more knowledge about cycling goods and services and a more

extensive social network compared to newcomers. We expect that people with a training schedule are more consciously involved in improving their level of performance, and therefore it is hypothesised that these cyclists spend more money on additional training methods, equipment (e.g., home trainer, heart rate monitor), food supplements, training camps, etc.

Fourth, cycling is an umbrella concept for a number of *cycling variants* (recreational cycling, road bicycle racing, mountain biking, bmx, etc.). Therefore, a control variable is added indicating which cycling variant the respondents associate themselves most with.

Finally, this paper also incorporates AIO variables into the regression. The AIO cycling statements used in the current research have already been validated for the specific case of running (Vos and Scheerder, 2009, with a Cronbach's alpha reliability of 0.75–0.81), which in their turn are based on broad statements used in previous research (e.g., van Bottenburg, 2006). Respondents were asked to give their opinion about a wide range of 62 cycling specific statements on a five-point Likert scale, such that insight is provided in their motives and image of cycling. A pilot study has been carried out in order to investigate the comprehensibility of the AIOs. Next, these 62 items were clustered into five psychographic components by means of a principal component analysis with varimax rotation (Cronbach's alpha reliability 0.72–0.87). An overview of the different components is given in Table 3, along with a few examples of the statements that were asked.

Table 3 The AIOs health, real sport, cycling identification, cycling drop out and low thresholds

Variable (component)	*Description*	*Number of items*	*Average score (on ten)*	*SD*
Health	Cycling is a healthy sport (physically, mentally, condition, etc.)	10	8.136	1.254
Real sport	Cycling is a prototype of a real sport (cycling is for tough fellows, I practice cycling because of the prestige associated with it, etc.)	7	4.212	1.606
Cycling identification	Level of identification with cycling and solidarity with other cyclists (I am proud to be a cyclist; I have respect for other cyclists, etc.)	15	5.681	1.417
Cycling drop-out	Probability of giving up on cycling (there is a chance that I will quit cycling because of time lack, because it is too expensive, too dangerous, etc.)	10	2.946	1.694
Low threshold	Cycling is a sport that is easy to practice individually (cycling is a sport that is easy to fit in my daily schedule, cycling is a sport that is best practiced individual, etc.)	8	5.944	1.640

3.4 Statistical analysis

Expenditure data usually contain a relatively large number of zero observations, which causes the data to be left-censored such that the normality assumption of ordinary least squares regression is violated (Pawlowski and Breuer, 2011). The present dataset contains 4.4% zero observations, which is a significant but rather low proportion when compared to other expenditure studies. A number of methods are used to cope with left censored data, namely Tobit (Tobin, 1958), two-step Heckman, and double hurdle (e.g., Humphrey et al., 2010; Lee, 2001; Pawlowski and Breuer, 2011). This study opts for the Tobit model, because this model best suits the data, as the number of zero-observations (90 zeros) is too limited in relation to the number of independent variables to calculate the determinants of the dichotomous consumption decision. Tobit regressions will be calculated for all independent variables together, but also for each variable group while leaving out the other three variable groups.

4 Results

The average annual cycling expenditure of the respondents on all cost categories is €961.4 (SD = 19.7). The last two columns of Table 4 stem from a Tobit regression that incorporates all variables at once, while in the first two columns the Tobit regression is run on each of the variable groups separately (respectively socio-demographic, intensity, cycling capital, AIOs).

Table 4 Tobit on the logarithm of the amount of money that is spent on cycling, per variable group (first two columns), and for all variables together (last two columns)

	Variable		*Tobit per variable group*		*Tobit for all variables*	
			Estimate	*t-value*	*Estimate*	*t-value*
Socio-demographic	Sex	Female (ref.)				
		Male	1.68***	7.90	0.40***	3.34
	Age	Continuous	0.02*	2.08	0.01	1.70
	Children	No (ref.)				
		Yes	0.13	0.63	0.14	0.18
	Partner	No (ref.)				
		Yes	0.14	0.57	–0.17	–1.42
	Education	Primary	–1.03**	–2.90	–0.27	–1.51
		Secondary	–0.44*	–2.00	–0.15	–1.42
		Higher (ref.)				
	Profession	Blue collar (ref.)				
		White collar	0.30	0.93	0.07	0.46
		Not in labour force	–0.25	–0.57	–0.30	–1.37

Table 4 Tobit on the logarithm of the amount of money that is spent on cycling, per variable group (first two columns), and for all variables together (last two columns) (continued)

	Variable		*Tobit per variable group*		*Tobit for all variables*	
			Estimate	*t-value*	*Estimate*	*t-value*
Sports intensity	Duration	< 60 minutes (ref.)				
		60–119 minutes	0.34	1.68	0.41**	2.83
		120–180 minutes	0.92***	4.59	0.38*	2.50
		> 180 minutes	1.00***	4.74	0.46**	2.83
	Frequency	< once a week (ref.)				
		One till three times a week	0.62***	3.99	0.44***	4.03
		≥ three times a week	1.04***	5.83	0.73***	5.43
	Level	Recreational cycling (ref.)				
		Performance-based	0.67***	4.42	0.31	0.28
		Competitive cycling	0.14	0.47	–0.51*	–2.17
	Context	Individual	0.11	0.56	–0.26	–1.81
		Light sports community	0.079	0.49	–0.20	–1.81
		Sports club (ref.)				
	Number of variants	1 (ref.)				
		2	0.20**	1.22	0.38***	3.21
		3	0.56***	2.82	0.38***	2.65
		≥4	1.26***	5.49	0.74***	4.45
Socio-econ. cycling capital	Cycling on TV	No (ref.)				
		Yes	0.59***	5.37	0.12	0.96
	Training program	No (ref.)				
		Yes	0.65***	4.81	0.17	1.13
	Literature	No (ref.)				
		Yes	0.86***	8.84	0.08	0.71
	Website	No (ref.)				
		Yes	0.88***	9.52	0.31***	2.99
	Cycling years	≤ 1990 (ref.)				
		1990–1999	–0.07	–0.63	0.09	0.76
		2000–2004	0.07	0.64	0.11	0.85
		2005–2009	0.01	0.05	0.97	0.73
	Other sport	No (ref.)				
		Yes	–0.06	–0.65	0.07	0.69

Table 4 Tobit on the logarithm of the amount of money that is spent on cycling, per variable group (first two columns), and for all variables together (last two columns) (continued)

	Variable		*Tobit per variable group*		*Tobit for all variables*	
			Estimate	*t-value*	*Estimate*	*t-value*
AIOs	Health	Continuous	–0.10**	–2.86	–0.03	–0.64
	Real sport	Continuous	–0.16***	–5.72	–0.05	–1.60
	Cycling identification	Continuous	0.58***	18.34	0.15***	3.22
	Cycling drop out	Continuous	–0.10***	–4.20	–0.07*	–2.45
	Low thresholds	Continuous	0.04	1.50	0.02	0.57
Control	Cycling variant	Recreational cycling (ref.)				
		Road bicycle racing	1.61***	17.43	0.41**	3.08
		Mtb	1.66***	10.90	0.56***	3.19

With all variables included in the Tobit regression, the variables sex, trip duration, frequency, number of cycling variants practised, visiting cycling websites, identification with cycling, being a mountain biker, and being a road bicycle racer positively determine cycling expenditure, while motivation to quit and competition are negatively associated with cycling expenses. With all explanatory variables included, sex is the only socio-demographic variable that significantly influences cycling expenditure. The other socio-demographic hypotheses were not confirmed when based upon the full Tobit model, so Hypothesis 1 can only be partially confirmed. When only the socio-demographic variables are included, education and age turn out to be significant determinants of cycling expenditure as well. While the effect of education is in line with Hypothesis 1, the positive age-effect is the opposite of what was expected.

Hypothesis 2a is confirmed, as cyclists spend more money when they participate in more cycling trips, when their cycling trips last longer and when they practise more cycling variants. In contrast with the socio-demographic variables, it does not matter whether all variable groups are included or not. Therefore, it can be stated that Hypothesis 2b is confirmed, as more sports-specific variables influence cycling expenses than the socio-economic variables do.

With all sports capital variables included, the only variable that turns out to be significant is whether one visits cycling-related websites or not. When a Tobit-regression is run with only the sports-capital variables, the other variables from the passive component also become significant, while the active components do not. We can conclude that cyclists who acquire cycling knowledge through passive leisure activities have higher cycling expenses (Hypothesis 3b), while no significant relationship is found for the active component (Hypothesis 3a).

Inclusion of the AIOs together with the other variable groups shows that people who associate themselves with cycling and with other cyclists turn out to be relatively big spenders, while the opposite holds for people who consider quitting from cycling. Both conclusions are in line with Hypothesis 4. When the other variable groups are left out, the factors ‘health’ and ‘real sport’ have a negative relationship with cycling expenses.

Apparently the AIOs are a relevant group in explaining sports expenses, a conclusion that certainly holds for cyclists who strongly identify themselves with their sport (Hypothesis 4).

Finally, the incorporation of the control variable indicates that road bicycle racers and mountain bikers are bigger spenders than recreational cyclists.

5 Discussion

While most studies focus on (expenditure on) sports participation in general (e.g., Lera-López and Rapún-Gárate, 2007; Thibaut et al., 2014), recent research has focused on specific sports activities which allows for exploring more specific variables than would be possible on an aggregated level (e.g., Hallmann and Wicker, 2015; Wicker et al., 2010). Variables that are often neglected in sports expenditure research turned out to be significant predictors of cycling expenditure, which is interesting in light of the ongoing search for explaining sports expenditure. Indeed, in the present study, socio-demographic variables influence sports expenditure to a lesser extent than in other socio-economic sports research (e.g., Lera-López and Rapún-Gárate, 2007; Thibaut et al., 2014). The results indicate that cycling expenditure is more influenced by sports intensity variables and AIOs than by classic orthodox socio-economic and socio-demographic variables. Apparently, sports expenses not only stem from rational decisions as suggested by the orthodox economic approach, but are also influenced by how sports participants feel and think about sports participation (Downward and Riordan, 2007).

A closer look at the detailed regression results provides valuable insights in the cycling consumer behaviour. This opens up opportunities for market segmentation, which is a key element in effective marketing planning (Taks and Scheerder, 2006). Overall, the biggest spenders are male cyclists who cycle intensively, do not take part in competition, consult specialist web pages and identify themselves strongly with their sport and fellow cyclists. In line with Taks and Scheerder (2006) these results confirm that managers and marketers need to understand the reason ‘why’ people participate (namely identification) instead of solely ‘who’ is partaking. Indeed, marketing departments should meet the cyclist’s need for identification, as intervening in the identification process turns out to be an effective strategy in raising the profit of companies. A closer look at the separate variable groups gives an insight in ‘who’ is spending money, and which categories could be targeted. A focus on older, higher educated cyclists, who watch cycling on TV, have a training program and/or read cycling literature could be a viable (supplementary) strategy for altering profits.

The results of the sports intensity variables provide interesting implications with regard to relationship marketing, implying that the acquisition of new customers is more expensive than retaining the current ones (Kim and Trail, 2011). Within the context at hand, and given our empirical results, this would for instance imply that commercial enterprises could consider cross selling strategies to convince road bicycle racers also to practise other variants such as mountain biking or indoor cycling or to organise cycling clinics and competitive events to induce longer and more frequent cycling participation. For public authorities and federations, targeting health policy objectives (e.g., reducing obesity) could be cost effective strategy because participants who cycle because of health reasons spend less money.

While most of the above regression results are in line with expectations and/or previous research, three are not. First, the results for the variable 'level of participation' are at first sight contrary to the expectations, as competition riders are found to spend less money compared to recreational cyclists. A possible explanation might be that in Flanders many competitive riders are sponsored in kind, as they receive apparel, equipment and training services from the team they ride for.

Second, when all variable groups with the exception of the socio-demographics are excluded, more variables turn out to be significant predictors of cycling expenditure. Age has a small but significant positive effect on cycling expenditure. This suggests that older cyclists spend more money on sports participation, which is in conflict with the results of other research (Dardis et al., 1994; Lera-López and Rapún-Gárate, 2007). A possible explanation is the fact that only a small part (5%) of our sample is older than 65. We can expect that the majority of the cyclists for whom age is a constraint already quit cycling at that age and consequently did not take part in the questionnaire.

Third, it is counter-intuitive that cyclists who define cycling as a prototype of a real sport spend less money. Additional analyses nuance this conclusion, as total expenditure is positively correlated with the variable 'real sport'. But if only the AIOs are included, the relationship becomes significantly negative, indicating that the cause of the negative relationship should be situated in the positive explanatory power of the other AIOs (which are health, cycling identification, cycling drop out, low thresholds).

6 Conclusions

While expenditure studies on overall sports participation and sports expenditure are rather abundant, less research is available on specific recreational activities (Lee, 2001). This paper aimed to fill that gap in the literature with regard to cycling, a popular sport that defines an important and growing market.

The investigated determinants were grouped into four categories, namely socio-demographics, sports intensity, sports capital and AIOs. While the variables of the former two categories are included in most socio-economic research on sports participation, the last two categories contain a large number of variables that have rarely been investigated in previous sports expenditure research. The results indicate that more sports intensity variables turned out to be significant contributors compared to the other variable groups. When expenditure is analysed within each specific group of variables separately, numerous significant results are found. The current study thus supports the use of a heterodox approach in modelling total cycling expenditure, which is in line with conclusions and suggestions of previous research (e.g., Downward, 2007; Scheerder et al., 2011c).

From a policy and business point of view, the results of this study are useful for the segmentation process of the management of sports governmental bodies, sports federations and commercial enterprises. Overall, the results indicate that the biggest spenders are male cyclists, who cycle intensively, consult specialist web pages and identify themselves strongly with their sport and fellow cyclists. These results could prove to be interesting for market segmentation purposes. For public authorities, it is interesting to know that participants who cycle because of health reasons seem to spend less money on cycling-related matters. Moreover, cycling expenses seem to be rather independent of socio-demographic factors, and therefore, from a socio-economic point of

view, cycling can be seen as a democratised sport that lends itself to obtain certain policy objectives (e.g., reducing obesity).

A limitation of the current study is that, although a large number of variables are included, income is not. Yet, both in the neoclassical and in the heterodox approach, income is often seen as an important determinant of cycling expenditure. Although income is correlated with seniority (variable age), education and kind of profession, we suggest that future research should focus on orthodox and heterodox variables that have been included in the current research, along with the variable income.

Given the aim of this study to investigate a large number of potential variables, and given the used method (Tobit regression), a large number of respondents is needed. An internet survey among cyclists is an ideal way of doing so. A disadvantage of this type of data collection is that it results in a biased sample as it is not necessarily representative for the total population. Furthermore, although cycling is a popular sport in western countries, regional differences are likely to exist. Therefore it would be interesting to investigate these variables in different countries. Future research should also focus on other popular sports activities such as running, swimming or fitness, or on relatively expensive sports such as horseback riding, or golf (e.g., Hallmann and Wicker, 2010).

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